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Chapter 9: Automation and Intelligence in Governance and Operations

9.1. Introduction

Governance might be defined as the rules and processes that shape the interaction of the agents of an organization (state or non-state) with their environment. The differential impact of governance on the organization's performance is widely acknowledged. It has become increasingly evident that more effective governance of corporations, multilateral institutions, global finance, and even philanthropic organizations can contribute to improving their performance.

The appraisal of the role governance plays in the state or public administration is more nuanced. It is generally accepted that sound governance can improve the delivery of public services, the development and implementation of policies, and the relationship between the government and its citizens, thereby increasing citizens' satisfaction with government. However, the impact of governance on the effective mobilization of functions for which government is primarily responsible maintaining peace and security, managing relations with other nations, and securing citizens' rights remains an open question. It is also true that the efficiency and quality of service delivery, policy design and implementation, and citizen engagement could be enhanced by more intensive application of modern technologies.

9.1.1. Scope and Objective

The introduction to a new research agenda on governance automation and operational intelligence identifies the scope and objectives of the inquiry. The main purpose is to lay down an analytical foundation for empirical applications of governance and administration automation and intelligence. Broad, interdisciplinary considerations shape the discussion in a manner suited for a research agenda within the social sciences and their applied branches.

Research agenda delineating the foundations of governance and administration automation and intelligence in the new paradigm of data-centric systems with advanced intelligent technologies. These enable a dramatic departure from the historical separation of the design and operational trajectories of public organisations and free up vast further resources for new and expanded services. Beyond service delivery, automation enables the intelligent design of new and improved policies through a deepened understanding of policy domains and the interactions between policy decisions and goals.

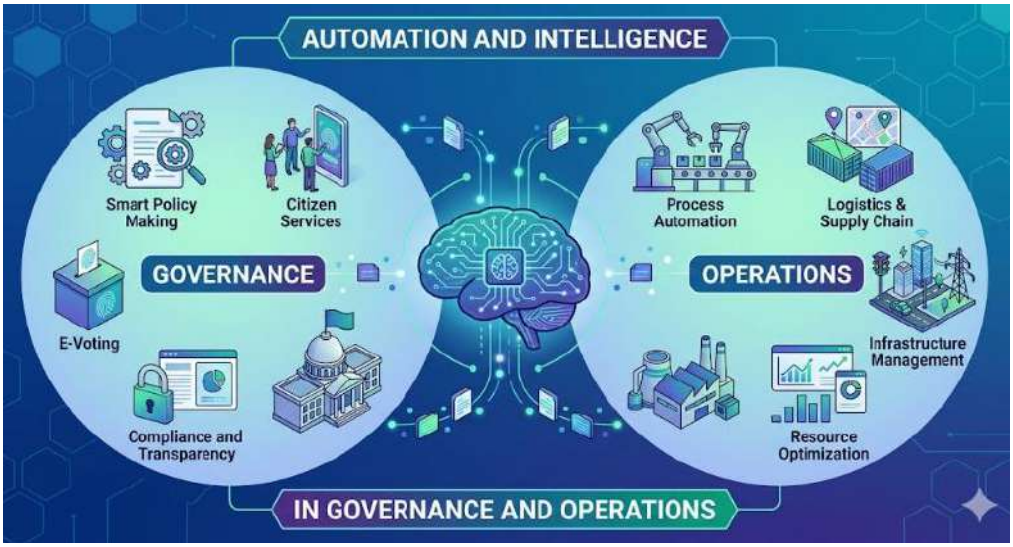

Fig 9.1: Smarter governance through AI automation

9.1.2. Research design

The research is organized in two interconnected sections. The first reviews the foundations of governance automation, examines its main application domains, and addresses fundamental ethical, legal, and social implications. The second section delves into the technical requirements of automation at multiple levels, offers a critical discussion of the main technical challenges and risks involved, and considers operational, organizational, and cultural hurdles.

Automation and artificial intelligence promise more efficient internal operations and significant improvements in interactions with citizens. In service delivery and citizen engagement, automation facilitates transaction processing, data access, and response to requests, while AI enables more complex conversations and proactive outreach. For policy design, analysis, and evaluation, large-scale data collection extends the information base, simulation models improve forecasting, analytical tools support impact assessment, and AI tools assist drafting.

9.2. Theoretical Foundations of Governance Automation

The area of automating governance and public administrative processes, including war-winning operations, is emerging as a topic of interest in AI, computer science, economics, political sciences, public administration, and sociology. It relates to the design, development, and deployment of AI tools in the public sector, but it expands beyond simply creating intelligent tools for executing tasks more effectively or efficiently. Here, the term governance automation is interpreted as a more generic type of control of human or machine operations war-winning operations included through the automation of action design and reasoning, a concept that extends into the area of governance quality: the better defined, engineered, and tested the action design controller is, the more automatic the decision-making process of the operators. The thesis presented here focuses primarily on the first area, but it encompasses four elements employed to articulate the key questions: automation of processes, automation of data-centric infrastructures, decision-making and policy-analysis assistive tools, and actor-aware tools for improving citizen engagement.

Governance automation is taken to mean the application of automation technologies to the policy design, analysis, and operational deployment functions of governance. These functions are generic in nature; they do not necessarily involve an administration or management level in a government hierarchy. The definition encompasses actions and operations in which the political execution is not required e.g., military geostrategy, water services contracting, public-safety social service contracts, industrial regulation, environmental monitoring but where answerability is a requirement.

9.2.1. Definitions and Scope

The cumulative impact produced by the combination of both automation and artificial intelligence (AI) applied to governance and policy operations will be significant. To obtain a first visual impression of the scope of these changes, four graphical representations are provided, covering Kriz and O'Leary's five-fold distinction between types of administrative automation, then Stephen E. Arnold's taxonomic view of governance automation, before diverging into two sub-areas based on the foundational numerical and general information models of automaton records and status records, respectively. The first graph summarizes the range of technological functions from offering complete processes, encompassing functions for routine decisions and support to human decisions up to providing analytical tools for policy experts. Generalizing the operation of each of these technologies leads to another view of the change impact, this time oriented towards a Kriz and O'Leary classification of the function type of technology rather than its functional application on the governance side.

Drawing from an earlier recognition of the key role played by the interaction between civil servants and citizens through supporting systems, policy-oriented governance-related literature now further enriches this perspective by merging Kriz and O'Leary's focus on the function type of technology with Policy Informatics research addressing tools provided to civil servants along Arnold's higher layers of a general administrative information model using a general architecture for automated governance, Data-Centric Infrastructure. The outcome is a picture-driven insight into the significant knowledge transformation dimensions engendered by the introduction of automated technology in governance operations, that is, in the actual implementation of policies impacting the life of citizens through service delivery.

9.2.2. Historical Evolution of Administrative Automation

During the late nineteenth and early twentieth centuries, several governments began to modernize their administrative and operational functions in response to growing political pressures to deliver promised services and facilities to the masses. These efforts were ostensibly bureaucratic in nature. Drawing inspiration from (1) the rational choice approaches of social scientists and the scientific management movement, which called for minimizing the signatory and execution time for key decisions; (2) the advanced mechanical simulation technology; and (3) Dogma-3 of Darwin's natural selection and survival by performance combined with Riggs' honeycomb metaphor; and (4) Sutherland's argument for a fully optimally efficient economy, a handful of thinking-space theorists proposed the most logical and thus most efficient administrative structure, thereby distributing the control and operation functions of the state and contracting out all key delivery functions to capable and willing providers. It was argued that optimal performance in signatory and execution times for key decisions could only be achieved through an artificial structure that in effect mimicked the performance of the economy as a whole the honeycomb analogy. These approaches did not involve true AIA since they were imitated on the basis of implicit heuristics. AIA in public service and administration thus deserves a review of past initiatives that at least partly aimed at making these functions natural-science based.

Agencies like the British India Office established fast-track mechanisms for handling Indian requests for foreign investment; the Government of India Speedy Committee fast-tracked permits for completing railways with South African and Australian financing; the Bengal administration established committees for fast-tracking requests for permits to the British India Government; and the Princely States fast-tracked offers during the Second World War for establishing rapid-advance technology and manufacturing bases with Japanese support for the Far East-Rear. Direct frontiers remained with the honeycomb analogy. With the large gaps in Indian technology and manufacturing, the

Princely States, partly inoculated against pandemic influences, could have emerged as the Semper Paratus in space not only for South East Asia but also for African nations behind the iron curtain.

9.3. Architectural Models for Automated Governance

The previous section analyzed the use of automation in governance through a data-centric lens, focusing attention on information infrastructure and database management at the level of the administrative engine. This section now adopts a process-centric perspective that examines automated governance as designed around autonomous functional modules: systems and subsystems, each with a clearly defined role in the performance of public functions and interlinked with other such modules through process-based integration.

The architectural models that arise from this perspective can be classified into two broad categories. Process-oriented automation is a focused approach in which human and automated processes are designed to work together for specific areas of administrative service delivery and agency operations. Data-centric Infrastructures integrate data across the operational lifetime of individuals and organisations, providing a continuous transactional record that spans its various interacting aspects. The design of data-centric governance infrastructure constitutes the minimal technical requirement for enabling automated governance at the level of the public administration as a whole and its constituent agencies.

Fig 9.2: Architectural models for automated governance

9.3.1. Data-Centric Infrastructures

Data integration is crucial for effective governance automation. It enables a comprehensive understanding of governance systems and a solid knowledge base for automated processes. Integrating diverse data sources is necessary for both simple tasks, such as chatbots associated with frequently asked questions, and advanced operations, like automated policy appraisal. Various data repositories exist for public policy, development indicators, urban planning, and public service performance. However, inconsistent access rules and incompatible databases hinder comprehensive analysis.

Several national-scale attempts at governance integration are underway. For instance, the Central Government's Digital India initiative integrates citizen services and data produced by Central and State Governments to bridge the gap between service delivery, accountability, administration, and citizen engagement. Building and maintaining a trustworthy knowledge base that policies, processes, and services utilize can significantly improve citizen experience and support policy oversight. Distributed Data Integration Augmentation Systems (DIA) provide a self-service platform to discover and integrate data from multiple operational systems, regardless of format or location.

Infrastructure that provides a single source of truth, reduces trust deficit and delivery frosts based on integrity, develops a feedback system for seamless governance, allows all government departments to become citizen-centric, and facilitates policy-making, controls, monitoring, and evaluation can address these pressing concerns. Data-centric infrastructure needs to support autonomous functioning and communication across departments. Ensuring the absence of black holes in governance by proactively enabling seamless data sharing across departments without procedural delays can realize the underlying vision.

9.3.2. Process-Oriented Automation

Widely extended across the public administration field are technology-supported workflows and services, whose integrated management allows the application of analytic techniques to operational data and related process execution reports. Such analysis has led to the identification of indicators to reveal bottlenecks or poorly functioning parts, and to provides recurrent support to governance decisions on service or process optimisation and resource allocation. Supported by these monitoring capabilities, an advanced too-embedded intelligence takes place when an in-depth analysis itemises usual service diversity, patterns, trends and relations, allowing to foresee surge of demand. Combined with automatic recall-generation, this information generates alerts for efficient positioning of public services in time and space.

9.4. Applications in Governance and Public Operations

Automation and artificial systems are essential for improving citizen services and reducing costs. These systems enhance the functioning of public organizations by supporting the design, analysis, and evaluation of public policies across their entire lifecycle.

The predominant area of application of automation in public governance remains the delivery of services to citizens and their involvement in public decision-making processes. However, the design, analysis, and evaluation of public policies are also amenable to automation. Policy-oriented processes are usually subject to external and strategic control (often political) by a small number of people, and consequently, the associated risks are manageable through appropriate ex-post mechanisms. Real-world implementations of these strategies include automatic systems for detecting tax fraud, assessing investment projects and evaluating policies.

The ethical, legal, social, technical, and organizational challenges of automation are numerous, but they can be addressed. The main difficulty lies not in the complexity of tackling the issues involved but rather in the inertia of human organizations. Manual systems tend to be stuck at lower levels of performance and security than automated systems. Even if it is possible for technical automation systems to malfunction and cause damage, more conventional systems present a different scale of systemic hazards that are often glossed over.

9.4.1. Service Delivery and Citizen Engagement

Service delivery represents perhaps the most straightforward application of automation and intelligent systems within governance. Most interactions between government and citizens occur within service delivery, either providing services or responding to citizen requests and complaints. A host of domains lend themselves to automation and system intelligence: chatbots can answer simple questions and direct citizens to the appropriate area, enabling constant availability; online service provision systems minimize the need for physical interactions; and monitoring systems can automatically determine if roads need to be cleared or waste collected. An increase in the number of online services correlates with an upsurge in citizen portals for one-stop service delivery and for gathering input for multiple public institutions, aiding both service delivery and data-gathering.

Integration and automation can enhance the citizen’s experience at these portals. Such efforts, however, hinge on the willingness of citizens to embrace these services. Luckily, demographic changes appear favourable to adoption; younger generations are more accustomed to technology and its use in service delivery; society’s expectations of

administration have risen; the development of innovative products and services has gained momentum; and new business models are creating opportunities for all types of for-profit and non-profit organizations. However, traditional systems have been slow to adapt and remain uninviting. Initiatives using these data to promote behaviour change such as pledging to reduce energy consumption during a heatwave demonstrate the potential reachable with simple tools.

9.4.2. Policy Design, Analysis, and Evaluation

Policies can be compared to programs intended to address a problem in society or the economy while contributing to the overall development of the State. Such policies respond to a problem, phenomenon, or opportunity that can often be described using information from various sources, such as academic research, historical records, and indices like those in the World Development Indicators. The structured analysis underlying the policy actualization phase constitutes the basis for a portfolio of alternatives, some of which may be new to the governance process, such as a new law or a new public solicitor's office. They can also serve as inputs for rules such as an agreement by the Federal Revenue Service, a position by the Ministry of Finance, or a bilateral agreement with another country. Typically, few types of policy decisions are open to the governing body: either decide to do something or decide not to do anything.

The two models of automated and intelligent governance presented in section 9.3 indicate that a variety of alternatives can materialize for fulfilling institutional assignments in the different levels of government. The demand for fundamental orders from the judicial branch, legislative assembly, or the executive is not limited to a small set, properly restricted and defined. The orders generated by the use of an external Assistant Agent that can define multimodal operators allow the exploration of a remarkable set of combinations. Beyond exploring active policy definitions, intelligent systems can also automate the analysis of established policies, searching for factors that impede the desired results. Operations conducted in the stable environment of the Authority Center of the model presented in section 9.2 support those analyses, and the results can be offered to other levels of government.

9.5. Ethical, Legal, and Social Implications

In addition to the operational advantages of automating governance processes, there are many ethical, legal, and social implications requiring caution, research, and mitigation. The automation of tasks performed in the administration and the delegation of decision-making to algorithms should guarantee citizens’ rights and freedoms, and ensure decision outputs and underlying processes are transparent, accountable, and explainable.

Automated systems must also deal with privacy issues, data governance, and the need for information security and personal data protection.

Immediate ethical concerns pertain to transparency, accountability, and explainability. Agents should reveal their identities when interacting with humans. Data, decision-making processes, and agents' methods should be disclosed to allow independent verification. Responsibility must be clear, either assigning it to the algorithm creators or establishing a general legal framework to hold both humans and algorithms accountable for decision outcomes. Ultimately, automated decisions must meet the same standards as human-made ones. A proposal for ensuring transparency and accountability is the creation of an information doctorat or decision audit. Such an entity could provide real-time and ex-articulo explanations of automated decisions and of the algorithms involved, whether for supporting public officers in their tasks or directly for the citizens.

9.5.1. Transparency, Accountability, and Explainability

To be accepted in society, the governance and administration systems, and any of their constituent elements, need to possess a sufficient level of transparency, accountability, and multi-level explainability, thus enhancing citizen trust. Machine learning algorithms used in the implementation of governance Automation and Intelligence certainly constitute black boxes.

Fig 9.3: Transparency, accountability and explainability in governance

Although deeper feature representations learned through data-driven models outperform those based on explicit rules, the opacity of AI models forms an obstacle in application domains that require a high level of trust. Besides, for information systems, transparency

goes beyond the explanation of results produced by external models. Indeed, these systems require advanced forms of explainability at several levels. To guarantee adequate transparency, it is thus necessary to exploit methods designed specifically to explain machine learning models, like counter-factual explanations, local interpretable model-agnostic explanations, and Shapley additive explanations, and at the same time to integrate these into an Information System transparency framework.

9.5.2. Privacy, Security, and Data Governance

Risks associated with privacy, security, and data governance are inherent in both process-oriented and data-centric automation. For process-oriented automation, expansive databases enable machine reasoning engines to generate executable recommendations. This requires that the input and reference datasets are not only complete but also correct, both in terms of content and collection mechanisms. At present, little is known of the completeness of the privacy-considerate datasets required for responsible design and evaluation of policies for delivering welfare benefits to the poor. Data access, use, and design and evaluation of privacy-preserving mechanisms demand the consideration of additional technical, operational, political, and organizational challenges.

The distributed storage of sensitive personal information, such as biometrics, taxation and health records, poses serious security concerns, especially when it varies in volume and when cybersecurity mechanisms have been designed for traditional, distributed systems rather than for systems of systems. On the other hand, centralised storage can create a single point of attack and prevent fraud detection in insurance systems. The mitigation of such risks requires specialised, and often distributed, competence in privacy and security considerations during system design and operation. Apart from appropriate mechanisms, appropriate competencies for implementing the mechanisms are further approved during – and not a prerequisite for – outsourcing security operations to private service providers and maintaining non-intrusive surveillance.

9.6. Challenges, Risks, and Mitigation Strategies

Automating decision-making processes in governance yields considerable benefits, but exposes governments to enormous risks and challenges. Malfunctioning automated decision-making systems can lead to severe consequences for citizens, and even if not logically faulty, these systems may produce unjust results. Indeed, while automated decisions can be perceived as fair and impartial, they may effectively reinforce biases rooted in the historical data on which the systems are trained. Nevertheless, these risks

can be mitigated by following established guidelines during policy design, implementation, and long-term management.

Governments seeking to make use of automated systems should abide by the following recommendations. First, they should establish a data-curation protocol, relying on validated taxonomy, ontologies, and codes to guarantee clean data inputs of consistent quality; such protocols also favour inter-system interoperability by implementing common mappings and enable jurists, ethicists, and sociologists to assess the appropriateness of decision-making. Second, development should take place in an open-source environment, fostering scrutiny by external specialists and the general public. Third, tests should cover all phases of the machine-learning life cycle, and all phases of any life cycle of artificial intelligence for decision-making that relies on machine-learning tools. Fourth, every newly generated product, be it a software, a prediction or an automated decision, should at least broadly respond to the "three As" of transparency, accountability, and explainability; ideally, all such products should be inherently self-explanatory and self-governing; for that third quality, extra engineering effort must be invested.

9.6.1. Technical and Architectural Challenges

Automated governance can appear a utopian vision, where all actions of the executive branch are seamlessly supported and guided by digital technologies, and new policies are proposed to legislatures with little human intervention. Yet, in any computerised business process the potential for a technical failure is omnipresent. Distributed systems consisting of many independent software components are less reliable than isolated pieces of software. In an automated governance architecture, the data errors originating from the production of administrative or business process records must be jointly considered as a failure for the transaction. All technical failures, be they piece of software malfunctioning, bugs, or data inconsistency, represent obstacles on the road to automated governance.

Technically, achieving decision-making and executive pathfinding automation in governance or any public operation is an extremely demanding problem. Efforts can instead focus on certain types of supporting or governance processes that should be automated, but for which these auxiliary processes would be already usable tools, alleviating efforts and speeding up delivery without running on autopilot. Minimally, just the legislative proposal can be automatically generated based on the automation of the executive processes, and automatically mapped into complete sets of records of administrative actions required for executing the proposal, but not actually operated by the machines.

9.6.2. Organizational and Cultural Barriers

All forms of governance transformation and modernization are hindered by the inability of organizations and societies to embark on radical and sometimes disruptive change. Overcoming inertia and building support for change are key determinants of success. Citizens and clients need to understand the benefits of new approaches, are often resistant to changes from traditional to automated service delivery modes and require reassurance that new approaches will work effectively. The value and attractiveness of new service delivery channels have to be greater than that of older channels for citizens to use them. A careful change management program is necessary based on research and educational programs that highlight the value and importance of governance innovation and transformation.

Organisations thrive on habit; stable hierarchy and responsibilities support behaviour that is efficient and convenient. Decisions are based on influence, politics and relationships, rather than rules, knowledge or technology. Such heuristics have developed to deal with an uncertain and unfriendly external environment. Service networks with multiple partners, clients and services have required a more complex multi-faceted framework of governance based on agile alliances, but the change has been gradual. The introduction of automated governance changes the external environment significantly. However, for many adopting these developments is daunting. The human agents involved cannot readily understand the scale of the task and are naturally reluctant to radically change structures, processes, skills and technologies. Trust and the establishment of long-lasting connections are central foundations of governance.

9.7. Conclusion

Governance automation and intelligence-enhanced operations have a positive impact on service delivery, citizen engagement, policy analysis and evaluation, and administrative capacities. By reforming decision support in repeated operations, the likelihood of performance degradation diminishes. Transparency, explainability, and accountability mechanisms safeguard against lack of understanding or loss of control.

9.6.1. Future Directions

The future of automation in governance will be largely determined by advances in artificial intelligence and machine learning technologies that enhance interaction with citizens, improve decision-making support, and ease the burden on public service personnel. These technological improvements will significantly facilitate the adoption of data-centric architectural approaches that seek to use public administration's existing

data, rather than the data at its disposal to automate existing operational processes. Because the latter has been possible for decades, it is not surprising that progress in this area has been slow. However, current technological developments may allow civil servants to shift from operational activity to thinking and designing, thereby initiating a step-change in efficiency and effectiveness.

Truly transformational innovation will only emerge when focus shifts away from experimentation and towards integrating governance processes with an increasingly sophisticated repertoire of algorithm-based decision aids. Such systems need to be crafted in a way that decision-makers understand what is done and why, and that sufficient human effort is applied to decisions that cannot be justified and communicated to citizens through standard channels. In this greater level of integration, decision-making support needs to be extended to political decision-making, enabling the same level of analysis and evidence-based thinking of the best officers in government. Achieving this goal will require the embedding of sophisticated data analysis, simulation, modelling, and assessment tools into policy design processes, in parallel with the scripting and provisioning of case decision-making and policy intervention support via digital assistants and other natural language interaction systems..

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